

ENTOMOLOGY.—*A review of the psocids, or book-lice and bark-lice, of Texas (Psocoptera).*¹ EDWARD L. MOCKFORD, University of Illinois, and ASHLEY B. GURNEY, U. S. Department of Agriculture.

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The psocids (Psocoptera) are one of the minor orders of insects, with only about 145 species recorded from the United States. Their obscure habits, small size, and limited importance are probably responsible for their nearly complete neglect by all but a very few entomologists, and it is probable that intensive study will double the number of known Nearctic species. This paper is designed to lay a foundation for future work on the psocids of Texas.

The principal specimens on which this report is based were secured by the junior author in 1951, when he visited Texas in company with O. L. Cartwright and, between September 18 and October 8, collected insects at about 55 localities in the eastern, central, and southern parts of the State. In addition to reporting on this collection, we have included information on other available Texas material, and previous records in the literature are also summarized.

It should be realized that the 1951 trip was only a beginning of a survey of the psocid fauna of the State as a whole, since it covered less than a third of Texas in a very hurried manner at one season of the year, and the beating of foliage was the chief collecting method utilized. The biotic provinces and physiographic regions of Texas are quite varied, and future collecting probably will disclose many additional species. Several publications on Texas natural areas may be helpful to future students. Blair (1950) described six principal biotic provinces, these representing some modifications of Dice's (1943) results and a considerable advance over Bailey's (1905) grouping, which consisted of traditional life zones based largely on temperature. Taylor (1945) and Russell (1945) have contributed other general works dealing with

factors that influence the distribution of animals of Texas.

The largest number of specimens taken in 1951 were beaten from foliage into a black umbrella, picked from the umbrella with a camel-hair brush dipped in alcohol, and placed in 70-percent alcohol. Others were found under bark, and a few were attracted to lights at night. Sifting ground litter and examining the outer surface of tree trunks were methods little utilized, though usually these are helpful and should be used in future psocid collecting. In general, psocids did not appear abundant until the Rio Grande Valley from Mission eastward was reached, and the very dry conditions over most of the State in 1951 may have been partly responsible for their scarcity. From Mission to Brownsville and along the east coast, palm trees, especially *Washingtonia filifera* Wendl. (introduced, probably from California), harbored many psocids. The dead fronds of untrimmed *Washingtonia* trees were excellent psocid habitats, especially the lower surfaces of the more apical portions.

Special mention should be made of the stands of the sabal or palmetto, *Sabal texana* Becc., near Brownsville. Originally there were extensive groves of the sabal on the delta about the mouth of the Rio Grande. Now, except for scattered remnants throughout the delta and extending as far north of Brownsville as Olmito, and about 80 miles west from the Gulf, native stands are largely restricted to the Southmost and Rabb "bends" of the Rio Grande, located about 6 to 12 miles southeast of downtown Brownsville. Several very profitable visits were made in 1951 to that portion of the Rabb Grove, which is owned by Mrs. R. M. McCormick, about 7 miles east-southeast of Brownsville. A full account of the sabal, with special reference to the groves at Southmost, is that of Davis (1942); an earlier review is by Small (1927), and

¹ Field work by the junior author was supported in part by a grant from the Penrose Fund of the American Philosophical Society.

Bailey (1944) has revised the group. This area south and southeast of Brownsville is the most nearly tropical portion of Texas, though there is a fairly severe frost about every 6 to 10 years, and light frosts are not rare. Although several plants and animals of the area are essentially tropical species, the area can not be considered part of the true Tropical Zone. A valuable summary of the plants and zonal affinities is by Clover (1937). The commercial growing of bananas and other tropical fruits is impossible in view of the occasional killing frosts. One of the most severe freezes, with temperatures below 19° F., occurred in early 1951, and is reviewed by Gunter and Hildebrand (1951). Goldman (1951, pp. 259-267) described Matamoros and nearby areas of northern Tamaulipas as Lower Austral, though invaded by some Arid Upper Tropical Subzone elements. Students of broad distributional problems may be assisted by Galtsoff, et al. (1954).

The pioneer worker on Texas psocids was Frank Aaron (1862-1947), of Philadelphia, Pa., whose life was reviewed by Calvert (1947). Aaron made a hunting trip on the plains of southwestern Texas when 16 years old. He collected Texas insects extensively in 1884, and it was probably then that he collected the five psocids he described in 1886. He discussed (1884) collecting insects, evidently mostly Lepidoptera, in the vicinity of Corpus Christi, visiting "heavy bottom lands," the coastal area, and "many broad pastures." He also made a wagon trip, for collecting purposes, of over 100 miles along the coast north of Corpus Christi. While we have not seen all the type series of his species, which are preserved in the Academy of Natural Sciences of Philadelphia, several specimens have been examined and found to bear no collecting data except a simple label, "Tex." Many natural habitats visited by Aaron probably have been greatly altered by agricultural and industrial developments; Cook (1908) has dealt with such changes in Texas.

Nathan Banks (1868-1953), for many years the only American student of psocids, described five psocids from Texas, and

others described by him doubtless will be found in the State eventually, in addition to some here recorded for the first time. P. J. Chapman (1930), in what was the first thoroughly modern important systematic work on Nearctic psocids, contributed very few Texas records additional to citing the Aaron and Banks types. Neither Chapman himself, nor C. R. Crosby and S. C. Bishop, who elsewhere in the United States were extensive collectors of material studied by Chapman, are mentioned as the collectors of any Texas psocids.

The beginning student of psocids is advised to consult such general works as Badonnel (1943, 1951) and Borrow and DeLong (1954). For identification of material Chapman's paper (1930) is quite basic for the genera he treated, and there is a growing list of recent revisionary works. The classification of families and higher groups in this paper follows that used by Badonnel (1951).

Faunal affinities: Of the 47 species mentioned in this paper, 15 are generally distributed throughout the eastern half of the United States. These are as follows: *Echmepteryx hageni*, *Trogium pulsatorium*, *Psyllipsocus ramburii*, *Lachesilla forcepeta*, *L. major*, *L. nubilis*, *L. pedicularia*, *Ectopsocus pumilis*, *Peripsocus madidus*, *Psocus pollutus*, *P. bisignatus*, *Trichadenotecnum unum*, *Ccrastipsocus venosus*, *Metylophorus purus*, and *Blaste quieta*. Of these, three are commonly spread by commerce and are found on both sides of the Atlantic. *Trogium pulsatorium* was with little doubt introduced into Texas by commerce since it is exclusively domestic in North America. *Lachesilla pedicularia* may be native to both Europe and North America, since it occurs commonly in both domestic and outdoor habitats in both continents. *Psyllipsocus ramburii* was probably introduced from Europe into domestic situations in North America, but it may be native to caves in Texas. It has not been recorded from as far south as Texas in dwellings, and the Texas specimens differ slightly in appearance from northern domestic material. Badonnel (1955) has recorded it from a cave in Angola.

Two species were probably introduced into Texas by commerce but are scarce in

North America generally. These are *Ectopso-cus richardsi* and *Lepinotus reticulatus*. *E. richardsi* is not recorded in the North American literature; both the Texas specimens and material taken in Florida by the senior author were from domestic habitats. It has also been found in large numbers in a Boston (Mass.) warehouse. *L. reticulatus* has been recorded from only two other North American localities (Gurney, 1949).

Cerobasis guestfalica, taken at one Texas locality, is probably native to North America as well as Europe. It is generally distributed throughout the western States (Colorado, Utah, California, Washington, Arizona) and has been found at one Florida locality (unpublished records of senior author).

Twelve Texas species show a definite tropical affinity. These include the species of *Rhyopsocus*, *Tapinella*, and *Archipsocus*, *Pseudocaecilius citricola*, *Pseudoseopsis hellmani* *Psocathropos* sp., and *Psyllipsocus oculatus*. The first five genera of this list are largely tropical and reach their northern limit around the Gulf of Mexico and up the southeastern Atlantic Coast. *Tapinella* has not previously been recorded in the North American literature. *Psyllipsocus oculatus* was previously of uncertain locality as the holotype was found on plants from Mexico at a quarantine station at Laredo, Tex.

The family Amphientomidae, represented in Texas by *Pseudoseopsis hellmani*, n. sp., has not previously been recorded from the United States. It is well represented in tropical South America, Africa, and India. The genus *Pseudoseopsis* contains only one other species, *P. vilhenai* Badonnel from Angola. The generic assignment of the Texas species is tentative, and collection of additional material may show that a new genus is desirable for it.

Acknowledgments: The 1951 trip of the junior author was greatly aided by a grant from the Penrose Fund of the American Philosophical Society. He is also grateful for cooperation and courtesies received during the trip from the following entomologists at the places mentioned: O. P. Breland (Austin); L. J. Bottimer, C. L. Smith (Kerrville); J. B. R. Leary (Laredo);

Paul C. Avery (Mission); F. A. Allen, R. A. Alexander, O. D. Deputy, R. B. Lattimore, C. H. Wallis, A. L. Williamson (Browns-ville). Laboratory facilities and/or assistance in reaching collecting localities at Kerrville, Laredo, Mission, and Browns-ville were generously provided by workers of the U. S. Department of Agriculture. Dr. B. C. Tharp, of the University of Texas, and Mrs. L. Irby Davis, of Harlingen, Tex., have since been of much assistance concern- ing the distribution of *Sabal texana*.

Suborder TROGIOMORPHA Roesler

Group ATROPETAE Pearman

Family LEPIDOPSOCIDAE Enderlein

Echmepteryx hageni (Packard)

Amphientomum hageni Packard, 1870, p. 405; *Echmepteryx agilis* Aaron, 1886, p. 17; *Echmepteryx hageni* (Packard) Enderlein, 1906, p. 320; *id.*, Mockford 1955, p. 438.

☞ Ten miles west of Orange, Oct. 8, 1951, beating oaks, 1 ♀, A. B. Gurney.

Family TROGIIDAE Enderlein

Lepinotus reticulatus Enderlein

Lepinotus reticulatus Enderlein, 1905, p. 31; *id.*, Gurney, 1949, p. 63.

Kerrville, Sept. 21, 1951, in floor litter of chicken house, 1 ♀, A. B. Gurney.

Trogium pulsatorium (Linnaeus)

Termes pulsatorius Linnaeus, 1758, p. 610. Synonymy discussed by Gurney, 1939.

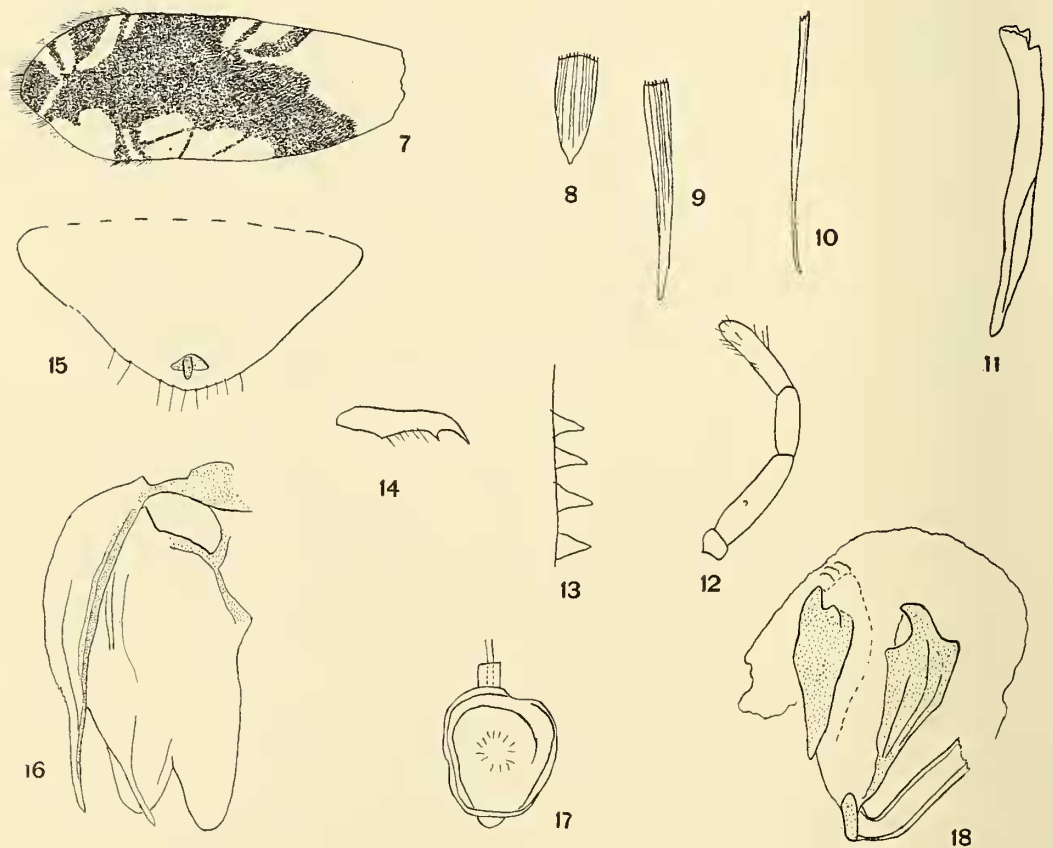
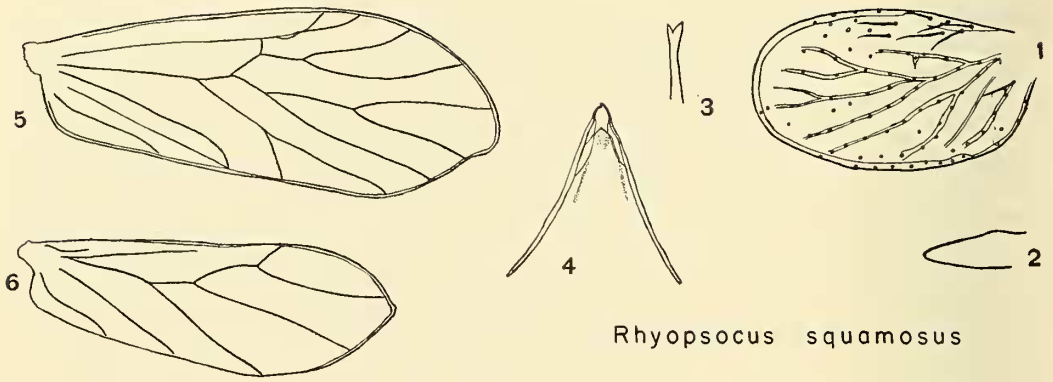
Corpus Christi, Aug. 1945, from house, 9 ♀, 4 nymphs, F. R. DuChanois.

Cerobasis guestfalica (Kolbe)

Hyperetes guestfalicus Kolbe, 1880, p. 132 (original description examined).

The spelling of *guestfalica* agrees with the feminine gender of *Cerobasis*, unlike *lapidarius* as given by Badonnel (1955, p. 32). The combination *C. muraria* used by Kolbe (1882, p. 212) also agrees. *Cerobasis* is comparable in gender to *Goniobasis* (shown as feminine by Brown, 1954, p. 124). Generic synonymy has been discussed by Gurney (1949) and given earlier by Roesler (1944, p. 131).

Kerrville State Park, Sept. 20, 1951, 7 ♀, 3 nymphs; Kerrville: U. S. Dept. of Agriculture



Pseudoseopsis hellmani

FIGS. 1-4.—*Rhyopsocus squamosus*, n. sp., male: 1, Front wing; 2, hind wing; 3, tip of lacinia; 4, parameres. FIGS. 5-18.—*Pseudoseopsis hellmani*, n. sp., female: 5, Front wing; 6, hind wing; 7, front wing, showing pattern of scales; 8, 9, scales of wing membrane; 10, scale from margin of wing; 11, lacinia; 12, maxillary palpus; 13, spines of row on front femur; 14, tarsal claw; 15, subgenital plate; 16, gonapophyses; 17, plate of opening of spermathecal duct; 18, sclerotization beside spermatheca.

Laboratory, Sept. 21, 1951, beating cedars, 5 ♀, 3 nymphs. Both collections by A. B. Gurney.

Family PSOQUILLIDAE Pearman

Rhyopsocus bentonae Sommerman

Rhyopsocus bentonae Sommerman, 1956, p. 146.

Corpus Christi, Oct. 6, 1951, beating palms, 1 ♂, 1 ♀, A. B. Gurney.

Rhyopsocus phillipsae Sommerman

Rhyopsocus phillipsae Sommerman, 1956, p. 146.

Ten miles west of Orange, Oct. 8, 1951, beating oaks, 1 ♂, A. B. Gurney.

Rhyopsocus squamosus, n. sp.

Figs. 1-4

Diagnosis.—Differs from *R. speciophilus disparilis* (Pearman), and presumably *R. s. speciophilus* (Enderlein), in smaller size (body length of that species 1.4 mm) and relatively shorter wings. Differs from *R. afer* (Badonnel) in paler color of head and thorax, relatively shorter wings, and in details of male genitalia. Differs from *R. bentonae* Sommerman in microptery and in details of male genitalia. Differs from *R. phillipsae* Sommerman in lack of abdominal tergal lobes of male, genitalic details, and shorter wings.

Holotype ♂.—Measurements: Total body length 1.17 mm; forewing length 0.37 mm; hind tibia length 0.20 mm; hind tarsus: T₁ 0.13 mm, T₂ 0.04 mm, T₃ 0.04 mm.

Morphology.—Brachypterous; forewings extending to about half length of abdomen and showing very faint venation (Fig. 1). Hindwings (Fig. 2) slightly longer than metathorax. IO/D = 1.62; PO/D² = 0.50. Anteroposterior diameter of eye 0.173 mm. Epicranial and frontal sutures present. Ocelli absent. Lacinia (Fig. 3) of usual type for the genus. Terminal segment of maxillary palpus clavate. Thoracic nota of the short-winged type with no prominent lobes. All tibiae with

three terminal spurs. Hypandrium unmodified. Parameres (Fig. 4) long, slender, diverging anteriorly. Sclerites of the penis canal complex, lacking denticles. Paraprocts each with a strong spine near inner margin and several cilia apparently lacking basal rosettes.

Color (from paratype in alcohol).—Eyes black; three brown pigment spots in ocellar positions; a few other tiny brown spots in front, otherwise head, body, and appendages pale straw-colored.

Type locality.—Texas, Olmito Resaca, near Brownsville, holotype ♂, 1 paratype, ♂, 1 nymph, Oct. 4, 1951, on vegetation, A. B. Gurney.

Types in U. S. National Museum, no. 62261.

Discussion.—This species is considered a brachypterous *Rhyopsocus* because its hind wings and lack of ocelli exclude it from the genera *Eosilla* Rib. and *Empheriella* Enderlein, and its *Rhyopsocus*-type lacinia exclude it from *Balliella* Badonnel. We consider *Deipnopsocus* Enderlein and *Rhyopsocopsis* Pearman (new synonymy) synonyms of *Rhyopsocus* Hagen. *Deipnopsocus* has already been placed in synonymy by Badonnel (1949, p. 29).

Rhyopsocus texanus (Banks)

Deipnopsocus texanus Banks, 1930, p. 223.

Type locality, Brownsville. This species cannot be recognized from the original description. It is discussed by Sommerman (1956). The type is in the Museum of Comparative Zoology, Cambridge, Mass.

Group PSOCATROPETAE Pearman

Family PSYLLIPSOCIDAE Enderlein

Psyllipsocus ramburii Selys-Longchamps

Psyllipsocus ramburii Selys-Longchamps, 1872, p. 146. Synonymy listed by Gurney, 1943.

Sonora, Wyatt Cave, July 23, 1926, 1 ♀; Hayes County: San Marcos, Sept. 15, 1953, under rocks in entrance to Ezel's Cave, 5 ♀, 2 nymphs, E. L. Mockford.

Psyllipsocus oculatus Gurney

Figs. 52-53

Psyllipsocus oculatus Gurney 1943, p. 214.

The female of this species, previously undescribed, is similar to the male in size and color. The gonapophyses (Fig. 53) differ from those of the other American species in possessing a rudimentary internal valve.

² It is not clear from Badonnel's explanation of PO (Badonnel, 1955, p. 18) exactly what is meant. As stated, it is a simple linear measurement which should be expressed in units and which would not show the prominence of the eye. In the text of Badonnel's paper, no units accompany the figures. Figures of comparable size, and which do express the prominence of the eye fairly satisfactorily are obtained by dividing the transverse diameter by the anteroposterior diameter (both measurements taken in dorsal view of the head.) Our figures for PO/D were obtained in this manner.

Mission, Sept. 30, 1951, beating palms, 1 ♂, 1 ♀, A. B. Gurney.

Psocathropos sp.

This species was discussed by Gurney (1949) as *P. lachlani* Ribaga, but until more information is available it may be best to avoid applying that specific name to our United States population. We are using Ribaga's original spelling of the generic name.

Houston, in house, July 26, 1941, M. Cockrell, 3 ♂, 2 ♀, 2 nymphs; Brownsville, on loose paper in laboratory, Oct. 3, 1951, A. B. Gurney, 1 ♀; Brownsville, in house, Oct. 31, 1951, F. A. Allen, 3 ♂, 1 ♀, 2 nymphs.

Suborder TROCTOMORPHA Roesler
 Group AMPHIENTOMETAE Pearman
 Family AMPHIENTOMIDAE Enderlein
Pseudoseopsis hellmani, n. sp.

Figs. 5-18

Diagnosis.—Differs from the African species *P. vilhenai* Badonnel in presence of ocelli and in shape of the gonapophyses of segment 9.

Holotype ♀.—Measurements: Total body length 2.83 mm; forewing length 2.73 mm; hindwing length 2.23 mm; hind tibia length 1.07 mm; hind tarsus: T₁ 0.67 mm, T₂ 0.107 mm, T₃ 0.107 mm.

Morphology (from holotype and paratypes).—Eyes bare, their posterior margins coinciding with the straight posterior margin of the vertex viewed from above. Three distinct ocelli located far apart, the laterals immediately beyond and below ends of frontal sutures and near compound eyes. Antennae of 12 segments, the basal flagellar segments quite long. Numerous indistinct striae on all flagellar segments, very close together toward the tip. Maxillary palpi covered with tiny hairs, interspersed with larger hairs arranged roughly in rows encircling the segments. Second segment showing three papillae (sensillae?) on one palpus of a paratype, only one on the other palpus; third segment somewhat shorter than second and fourth. Lacinia as in Fig. 11, slightly curved near tip. Forewing (Fig. 5) with a slightly extended apex, the extended portion actually rounded. Distal portion of Sc distinct. Scales of membrane mostly short and wide with the apex truncate (Fig. 8), but some quite slender (Fig. 9). Marginal scales slender; some extremely slender with the

apex slightly emarginate (Fig. 10). Hind wing with acute apex; vein R₁ nearly reaching wing margin; vein Ax strongly curved. Scales mostly slender; some marginal scales extremely long and slender with emarginate apices.

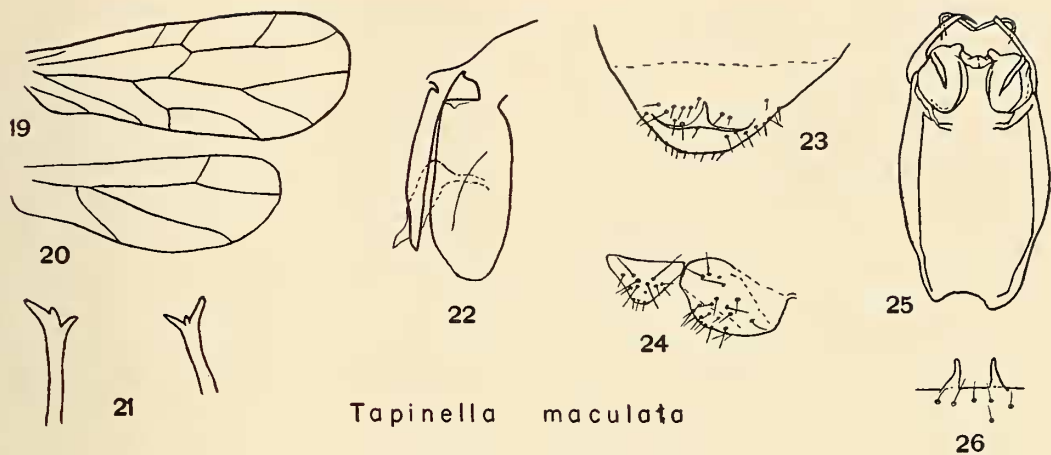
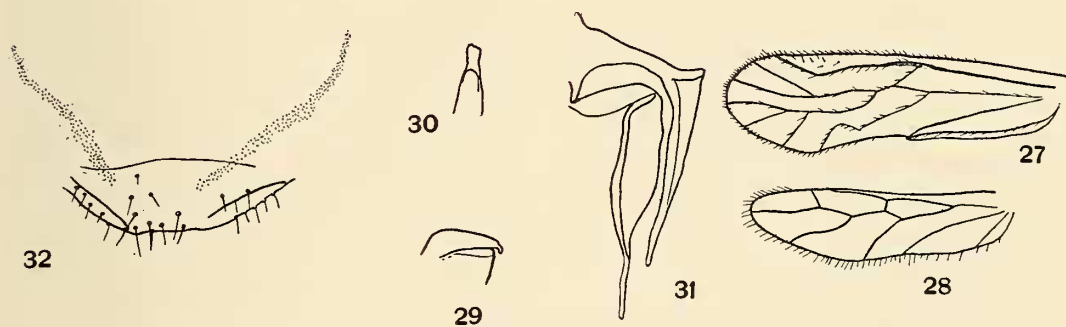
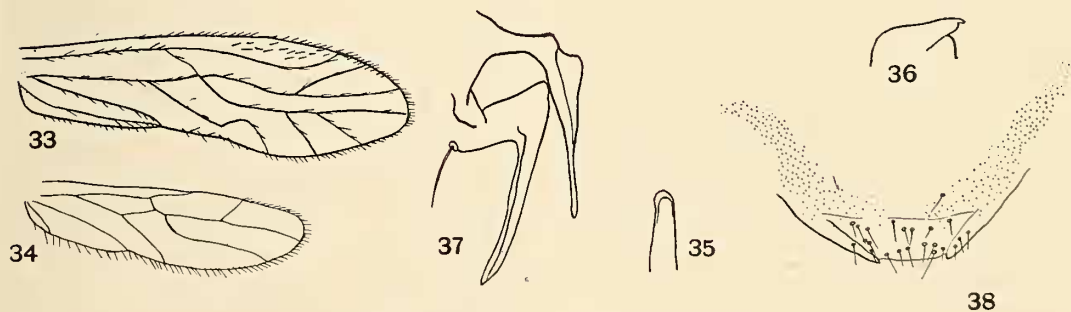
Anterior femur with a row of 25 spines (Fig. 13) with wide bases, not articulated. Other spination of legs summarized in Table 1. Twenty-two ctenidiobothria on T₁ of hind leg. A small comb running to the claw at apex of T₃ of each leg. Claw with single preapical tooth and a row of tiny hairs ventrally (Fig. 14).

Genitalia and terminalia.—Subgenital plate (Fig. 15) with a sclerotized process. Gonapophyses (Fig. 16): ventral valve long, slender, acuminate apically with a sclerotized inner edge; dorsal valve acuminate apically; lobes of external valve rounded apically. Sclerite of spermathecal opening (Fig. 17) and sclerite beside spermatheca (Fig. 18) as illustrated. Epiproct and paraprocts covered with long, slender hairs; paraprocts each with a field of hairs with basal rosettes.

Scale color pattern (from dry specimens).—Head except eyes covered with slender, curved pale-gray scales. Mesonotum covered with short, wide white scales. Femora covered with dirty-gray and brown scales; fore and middle tibiae

TABLE 1.—SPINATION OF LEGS IN PSEUDOSEOPSIS HELLMANI

Region of leg	Number of spines on—		
	Prothoracic leg	Meso-thoracic leg	Metathoracic leg
Femur apex	None	1 lateral 1 curved, external	1 lateral 1 curved, external
Body of tibia	None	1, 1/4 distance from base 1 near apex	External—1, 1/8 from base 1, 3/8 from base 2, 3/8 from base 2, 1/2 from base Lateral 1, 1/8 from base Internal 1, 1/8 from base 2, 1/8 from base 2, 1/2 from base
Tibia apex	1	5	6
First tarsal segment	3 near apex, ventral 2 apical, ventral	3 near apex, ventral 2 apical, ventral	3 near apex, ventral 2 apical, ventral
Second tarsal segment	1 apical, ventral	2 apical, ventral	1 apical, ventral
Third tarsal segment	None	None	None

*Tapinella maculata**Caecilius palmarum**Caecilius caloclypeus*

FIGS. 19-24.—*Tapinella maculata*, n. sp., female; 25-26, same, male: 19, Front wing; 20, hind wing; 21, tips of laciniae; 22, gonapophyses; 23, subgenital plate; 24, epiproct and paraproct; 25, phallic frame; 26, posterior margin of 9th abdominal tergite. FIGS. 27-32.—*Caecilius palmarum*, n. sp., female: 27, Front wing; 28, hind wing; 29, tip of mandible; 30, tip of lacinia; 31, gonapophyses; 32, subgenital plate. FIGS. 33-38.—*Caecilius caloclypeus*, n. sp., female: 33, Front wing; 34, hind wing; 35, tip of lacinia; 36, tip of mandible; 37, gonapophyses; 38, subgenital plate.

covered with brown scales except for an apical band of white scales on each. Hind tibia with a basal, medial, and apical band of white scales, the remainder covered with brown scales. Tarsi: each T_1 with an apical band of dirty white scales, the remainders covered with brown scales. Forewings marked with a complex pattern of gray and white scales (Fig. 7); in areas of white scales adjacent to the wing margin, the long marginal scales are white. Hind wings not visible on the dry specimens. Scales very sparse on abdomen.

Type locality.—Texas, Ezel's Cave (near San Marcos, Hayes County), holotype ♀, 4 ♀ paratypes and 2 nymphs, Sept. 15, 1953, on limestone outcrop at mouth of cave, R. E. Hellman and E. L. Mockford.

Holotype and one *paratype* in U. S. National Museum, no. 63276; remaining paratypes in E. L. Mockford Collection.

Discussion.—We have chosen the following characters as important for generic diagnosis in the Amphientomidae: (1) Shape of forewing apex, (2) nature of spines in row on femur I (they may be numerous, wide, and unarticulated, or few, slender, and articulated), (3) number of preapical teeth on tarsal claws, (4) curvature of laeina, (5) shape of scale apices and pattern of striation on scales, and (6) presence or absence, and size and number of sensory cones on second segment of maxillary palpi. The Texas species agrees with the genotype of *Pseudoseopsis* in four of these characters, whereas it agrees with no other closely related genus in more than three. It is also very similar to *P. vilhenai* in general shape of the wings.

This species is named for Robert E. Hellman, of New York City, a herpetologist and former classmate of the senior author at the University of Florida. His companionship and aid on many field trips, including the one on which the type series of this species was taken, are gratefully acknowledged.

Group NANOPSOCETAE Pearman

Family LIPOSCOLIDAE Enderlein

Genus *Liposcelis* Motschulsky

Dr. Kathryn M. Sommerman has very kindly examined our material in this genus and informs us (in litt.) that it contains five species, three of which are described as new in a paper which she has in press.

Family PACHYTROCTIDAE Enderlein

Tapinella maculata, n. sp.

Figs. 19–24

Diagnosis.—Differs from *T. formosana* Enderlein and *Psylloneura williamsi* Banks (probably a *Tapinella*) in color, these species being pale yellow-brown, unmarked. Differs from *T. castanea* Pearman, *T. africana* Badonnel, *T. squamosa* Badonnel, and *T. curvata* Badonnel also in color, these species being largely dark brown.

Holotype ♀.—Macropterous. Measurements: Total body length 1.60 mm; forewing length 1.40 mm; hindwing length 1.07 mm; hind tibia length 0.53 mm; hind tarsus: T_1 0.24 mm, T_2 0.05 mm, T_3 0.07 mm.

Morphology.—Compound eyes not exceeding posterior margin of head. Epierianal and frontal sutures distinct. Ocellar triangle slightly nearer clypeus than posterior margin of head. Suture between clypeus and front straight when viewed from above. Mouthparts of usual type for the group. Laeina slender, tridentate at apex (Fig. 21). Maxillary palpi lacking specialized sensory spines. Antennae of 15 segments which are secondarily ringed from the distal half of F_5 outward to the tip. Wings unmarked. Venation of usual form for the genus; closed cell absent in hind wing. Abdomen completely membranous, including genitalia. Gonapophyses as in Fig. 22, closely associated with an appendage from the paraproct, shown under the external valve in the figure. Subgenital plate bearing T-shaped sclerite with arms long and curved.

Color (in alcohol).—Ground color cream, eyes black. A pale red-brown band from each compound eye through base of antenna to about midpoint of clypeus, the two bands meeting there. An irregular dark red-brown band on each side of thorax just above coxal insertions. Abdomen marked with six series of red-brown spots from segments 1 through 8 (one spot in each series per segment): two dorsal series of rather pale spots wider than long, a paired dorso-lateral series of dark U-shaped spots with open ends of U-s directed posteriorly, and a paired ventro-lateral series of spots longer than wide.

Allotype ♂.—Apterous. Measurements: Total body length, 1.13 mm; hind tibia length 0.40 mm; hind tarsus: T_1 0.13 mm, T_2 0.05 mm, T_3 0.07 mm. Differs from holotype in smaller size, aptery and associated characters of absence of ocelli and flat notal lobes, and absence of frontal sutures. Genitalia as in Fig. 25.

Variation.—Some female paratypes are apterous, lack ocelli, and lack all trace of subdivisions of the pterothoracic tergites (in macropterous forms each pterothoracic tergite is composed of a trilobed scutum and separate scutellum); these have only a trace of frontal sutures. Among alate females much variation exists in details of venation; it is seldom bilaterally symmetrical. Variations observed are: (1) A closed cell in hind wing at point of first branching of the main vein, (2) radial branch in hindwing disconnected from main vein, (3) a closed cell in forewing formed by presence of two R-M crossveins, (4) R_s in forewing 3-branched, (5) Cu_{1b} in forewing set at angle of Cu stem, (6) R + M in forewing joined at a point.

Type locality.—Texas, Mission, holotype ♀, allotype ♂, 2 ♂ paratypes, 7 alate ♀ paratypes, 20 apterous ♀ paratypes, and 5 nymphs, Sept. 30, 1951, on palm leaves, A. B. Gurney. Other paratypes—Texas, Palm Grove near Brownsville, 5 apterous ♀, 1 nymph (not paratype), Oct. 2 and 3, 1951, beating palm leaves; Olmito Resaca, 1 apterous ♀, 1 nymph (not paratype), Oct. 4, 1951, beating vegetation; all collected by A. B. Gurney.

Types in U. S. National Museum, no. 62264.

Tapinella sp.

A single female taken at Weslaco on dead palm leaves, Oct. 1, 1951, differs from *T. maculata* in its uniform straw-brown color (slightly darker on head and terminal abdominal segments). It is probably a new species since the arms of the T-shaped sclerite are longer than in *T. maculata*.

Suborder PSOCOMORPHA Weber

Group CAECILIETAE Pearman

Family CAECILIIDAE Enderlein

Caecilius palmarum, n. sp.

Figs. 27-32

Diagnosis.—A pale yellow species, differing from the other North American species with that coloration (*C. aurantiacus* (Hagen), *C. manteri* Sommerman, *C. sommermanae* Mockford) in being marked with a brown band longitudinally through the vertex, front, and clypeus. Head and wings narrower than in these other species.

Holotype ♀.—Measurements: Total body length 2.67 mm; forewing length 2.57 mm; hindwing length 1.87 mm; hind tibia length 0.90 mm; hind tarsus: T_1 0.267 mm, T_2 0.107 mm.

Morphology.—IO/D = 1.28. Lacinia with a slender, blunt tip (Fig. 30). Tip of mandible bearing a hooked tooth. Wing venation and ciliation normal for the genus. A long fusion of R_s and M in both fore and hind wings. Gonapophyses (Fig. 31) straight with slender tips. Subgenital plate (Fig. 32) with sclerotized area in the form of a pair of slender, converging bands visible after staining.

Color (in alcohol).—Eyes black. Antennae, anal veins, and veins of apical one-third of forewing straw colored. Rest of body pale yellow except for a pale brown band from immediately anterior to occiput on vertex to lower border of clypeus, and pale brown lateral areas on thoracic tergal lobes.

Type locality.—Texas, Olmito Resaca, 9 miles north of Brownsville, holotype ♀, 50 ♀ paratypes, and 57 nymphs, Oct. 4, 1951, beating palms and palmettoes, A. B. Gurney. Other paratypes (not including nymphs), Palm Grove near Brownsville, 14 ♀, numerous nymphs, October 1 and 3, 1951, beating dead leaves, Gurney & Allen; western outskirts of Corpus Christi, 70 ♀, 24 nymphs, Oct. 6, 1951, beating palm leaves, A. B. Gurney.

Types in U. S. National Museum, no. 63237.

Caecilius calocylpeus, n. sp.

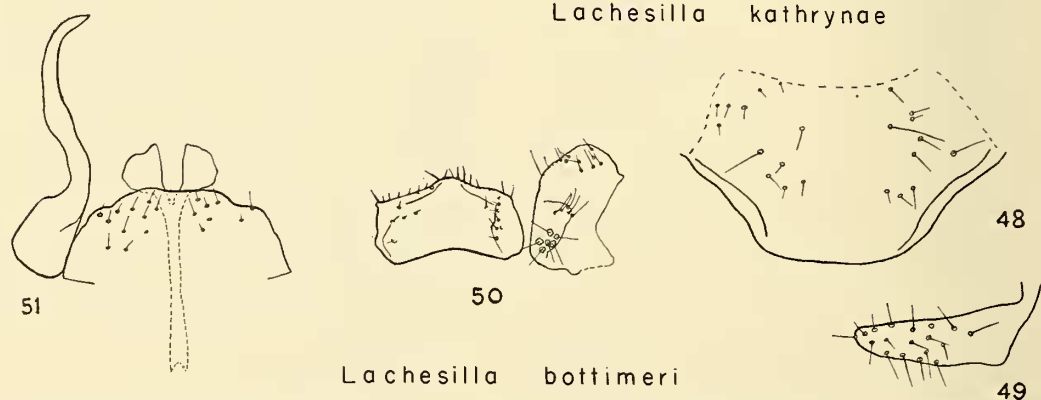
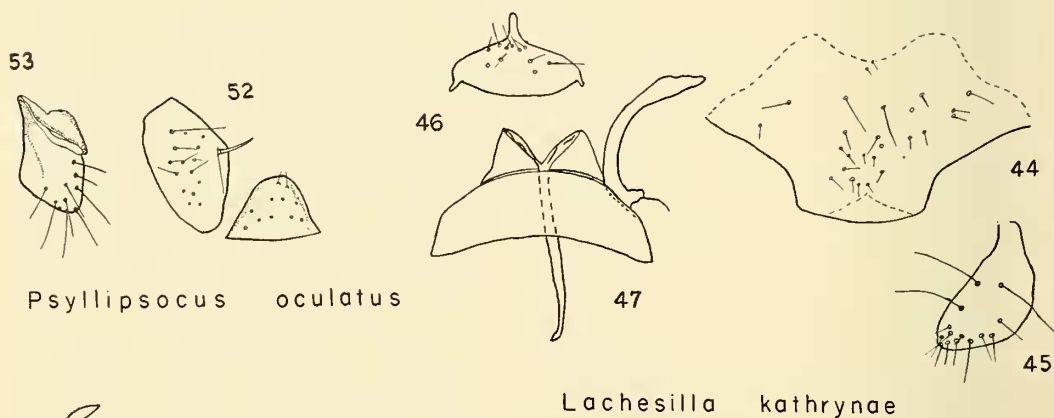
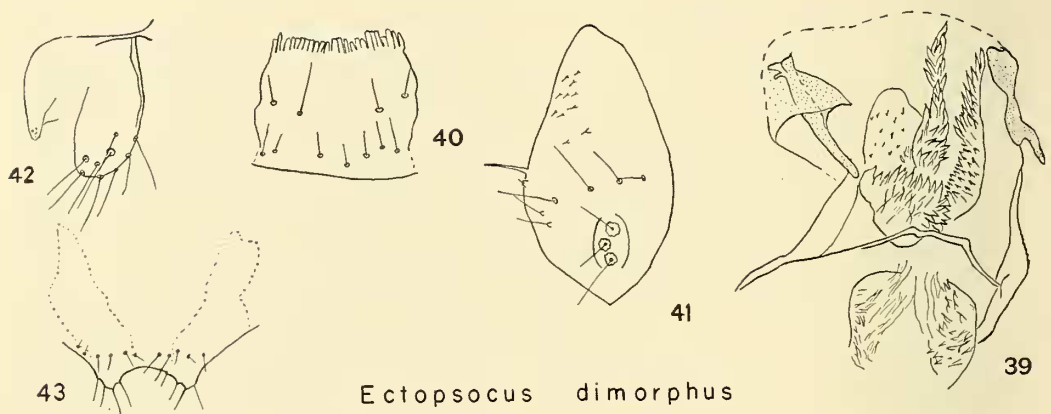
Figs. 33-38

Diagnosis.—A pale-yellow species, differing from the other North American species with that coloration in that the only conspicuous body marks are several pairs of clypeal striations.

Holotype ♀.—Measurements: Total body length 2.93 mm; forewing length 2.87 mm; hindwing length 2.13 mm; hind tibia length 1.07 mm; hind tarsus: T_1 0.267 mm; T_2 0.107 mm.

Morphology.—IO/D = 1.57. Lacinia rounded at tip. Tip of mandible bearing a straight tooth. Wing venation and ciliation normal for the genus. A short fusion of both R_s and M in both fore and hind wings. Gonapophyses (Fig. 37) a pair of curved blades; valve of 9th bearing a stout basal seta. Subgenital plate (Fig. 38) with sclerotized area as a pair of converging bands, wider than in *C. palmarum*, visible after staining.

Color (in alcohol).—Eyes black. Antennae, fore tibiae and tarsi, and veins in apical half of forewing straw colored. Rest of body pale yellow except for seven pairs of purplish brown striae on clypeus and a faint purplish brown band on each



FIGS. 39-40.—*Ectopsocus dimorphus*, n. sp., male; 41-43, same, female: 39, Apex of phallic frame (somewhat distorted) and penis sclerotizations; 40, ninth abdominal tergite with comb; 41, paraproct; 42, gonapophyses; 43, subgenital plate. FIGS. 44-45.—*Lachesilla kathrynae*, n. sp., female; 46-47, same, male: 44, Subgenital plate; 45, gonapophysis; 46, epiproct; 47, hypandrium and parameres. FIGS. 48-49.—*Lachesilla bottimeri*, n. sp., female; 50-51, same, male: 48, Subgenital plate; 49, gonapophysis; 50, epiproct and paraproct; 51, hypandrium and parameres. FIGS. 52-53.—*Psyllipsocus oculatus* Gurney, female: 52, paraproct and epiproct; 53, gonapophyses. (All drawings by the senior author.)

side running the length of the lateral prothoracic sclerites.

Type locality.—Texas, Palm Grove near Brownsville, holotype ♀ and 2 nymphs, Oct. 1, 1951, beating palms. Paratypes—Mission, 1 ♀, Sept. 30, 1951, beating palmate palms; Olmito Resaca near Brownsville, 1 ♀, Oct. 4, 1951, beating palms and palmettoes. All collected by A. B. Gurney.

Types in U. S. National Museum, no. 63238.

Group HOMILOPSOCIDEA Pearman

Family PERIPSOCIDAE Pearman

Peripsocus madidus (Hagen)

Psocus madidus Hagen, 1861, p. 12. Synonymy presented by Chapman, 1930.

Bexar County, May 5, 1938, swept from peach, 4 ♂, 14 ♀, 1 nymph.

Ectopsocus richardsi (Pearman)

Chaetopsocus richardsi Pearman, 1929, p. 105;
Ectopsocus richardsi Pearman, 1942, p. 290.

Houston, April 15, 1948, in stored rice, 3 ♂, 2 ♀, R. T. Cotton; Beaumont, July 18, 1936, cracks in floor in rice mill, 1 ♂, 1 ♀, A. L. Balzer.

Ectopsocus dimorphus, n. sp.

Figs. 39–43

Diagnosis.—Very similar to *E. pearmani* Ball of Belgian Congo, differing chiefly in shape of subgenital plate, the apical lobes being further apart in the present species; also differing slightly in several measurements. Males micropterous (nearly apterous); females dimorphic: macropterous and micropterous.

Holotype ♀.—Macropterous. Measurements: Total body length 1.43 mm; forewing length 1.40 mm; hindwing length 1.17 mm; hind tibia length 0.50 mm; hind tarsus: T_1 0.187 mm, T_2 0.080 mm.

Morphology.—Epieranial and frontal sutures distinct. Eyes small but prominent. IO/D = 2.9; PO/D = 0.65; anteroposterior diameter of eye 0.133 mm. Vertex, front, and postclypeus covered with curved setae. Antenna somewhat shorter than forewing. Ratio of f_1 to Sc+P = 1.8; ratio of f_1 to $f_2 + f_3$ = 0.76. Eight ctenidiobothria on first segment of hind tarsus; none on that of middle tarsus. Stigma sack of normal length, rounded apically. In forewing R_s meets M for a short distance, or the two are connected by a short cross-vein. Hairs on wings restricted to stem of R, stem

of M + Cu, and Ax in forewing; these hairs few and short. Gonapophyses (Fig. 42): internal valve very minute; ventral valve with spinulose apex; external valve a thumblike flap, mostly sclerotized, bearing 10 setae distally. Subgenital plate (Fig. 43) bilobed apically, each lobe with several marginal setae. Paraprocts (Fig. 41) bearing four trichobothria and a median row of five setae; duplex spine of inner margin very minute.

Color (in alcohol).—Eyes black. Body and appendages generally tawny brown. Membranous portion of abdomen pale, ringed with brown (subcuticular pigment). Wings unmarked, slightly tawny.

Allotype ♂.—Micropterous. Measurements: Total body length 1.27 mm; hind tibia length 0.467 mm; hind tarsus: T_1 0.147 mm, T_2 0.080 mm. Differs from holotype in much smaller size and microptery; wings represented by two pairs of small fleshy lobes, each bearing a few bristles. IO/D = 2.2. PO/D = 0.6, anteroposterior diameter of eye 0.133 mm. Ocelli absent. Thoracic tergites of micropterous type, with large prothoracic tergite and pterothoracic tergites not divided into lobes. Similar in color to holotype, but abdominal rings more distinct. Each abdominal tergite bearing a distinct row of bristles. Tergite 9 adorned with a comb of teeth (Fig. 40). Penis and parameres (Fig. 39) with external parameres rather far apart so that aedeagal arch is wide. Sclerotizations of penis consisting of a pair of rods spinose apically, a hook on each side externally (not symmetrical), and other small sclerites of the canal.

Variation.—Micropterous females occur with wing pads not reaching the abdomen. These have typical undivided thoracic tergites of the short-winged type, and ocelli represented by three small subcuticular pigment spots. Setae of the vertex, front, and postclypeus are somewhat shorter than in the macropterous forms.

Type locality.—Texas, Brownwood (Brown County), holotype ♀ and a large number of macropterous paratype ♀♀ May 14, 1939, from peach, L. S. Jones. Allotype ♂, Texas, Tyler, Nov. 24, 1939, on cover crop in peach orchard, associated with 4 micropterous ♀ paratypes and 2 nymphs, L. D. Christensen. Other paratypes—Texas, Brownwood (Brown County), 1 macropterous ♀, March 26–27, 1939, from peach, L. S. Jones; Bangs (Brown County), 4 macropterous ♀, June 8, 1938, sweeping peach and cover crops.

Christensen et al.; Brown County, 1 micropterous ♀, 2 macropterous ♀, July 14, 1937, peach orchard, Turner & Anderson; Bexar County, 11 macropterous ♀, May 5, 1938, on peach, W. R. Turner; same locality, 1 macropterous ♀, 6 micropterous ♀, Nov. 23, 1938, on soil under grass and leaves in peach orchard, W. F. Turner; Dallas, 1 macropterous ♀, May 25, 1939, on cane, W. G. Bruce; El Paso County, 7 micropterous ♀, July 22, 1937, on soil in peach orchard, Turner & Anderson. New Mexico, Albuquerque, 8 micropterous ♀, 1 ♂, 1 nymph, March 3, 1938, from soil, L. D. Christensen; same locality, 2 micropterous ♀, December 9, 1939, from soil, L. D. Christensen. California, Cherry Valley, 3 macropterous ♀, May 7, 1937, on peach and in soil, Christensen & Jones; Hemet, 1 ♂, 1 micropterous ♀, Jan. 13, 1938, in soil, Christensen et al.; Los Angeles County, Ranger Station at west fork of San Gabriel River near Mount Wilson, elevation 3,200 feet, 1 ♂, 1 micropterous ♀, Sept. 9, 1953, in ground litter under California Live Oak, E. L. Mockford; Georgia, Decatur County, Woodruff Dam site near Florida line, 1 ♂, 1 micropterous ♀, June 2, 1953, in ground litter on hillside in newly cleared field, E. L. Mockford.

Holotype, *allotype*, and most of *paratypes* in U. S. National Museum, no. 63239.

Ectopsocopsis pumilis (Banks)

Peripsocus pumilis Banks, 1920, p. 313; *Ectopsocus pumilis* (Banks), Chapman, 1930, p. 380.

Beaumont, Oct. 8, 1951, beating palms, and in rice straw near rice experiment station, 4 ♂, 9 ♀; western outskirts of Corpus Christi, Oct. 6, 1951, beating palms, 3 ♀, 1 nymph; 9 miles north of Brownsville, Oct. 4, 1951, beating palms and palmettoes, 1 ♀, 2 nymphs. All collected by A. B. Gurney.

The genus *Ectopsocopsis* has recently been described by Badonnel (1955, pp. 185, 193).

Family PSEUDOCAECILIIDAE Pearman

Pseudocaecilius citricola (Ashmead), n. comb.

Psocus citricola Ashmead, 1879, p. 228; *Caecilius pretiosus* Banks, 1920, p. 311 (new synonymy); *Pseudocaecilius wolcottii* Banks, 1924, p. 423 (new synonymy); *Pseudocaecilius pretiosus* (Banks), Chapman, 1930, p. 332.

San Antonio, 3 ♀ (holotype and paratypes of *C. pretiosus* Banks).

Four specimens on paper points were found in

the U.S. National Museum which apparently are cotypes of *Psocus citricola* Ashmead. Each bears a printed label "Jacksonville, Fla." and a handwritten label "*Psocus citricola* Ashm." The writing on the latter labels has been identified as that of Ashmead by A. B. Gahan, long a Hymenoptera specialist at the National Museum. Ashmead lived in Jacksonville when he published the description of this species, and most of his collecting was done locally. From the dry specimens it can be seen that all are the same species, a *Pseudocaecilius*. One, here selected as lectotype (U.S.-N.M. type no. 63247), has been soaked from its point in KOH solution and mounted on a slide for critical comparison with paratypes of *pretiosus* and *wolcottii* borrowed from the M.C.Z. Since no differences of specific magnitude have been noted in wing markings, venation, ciliation, measurements of head, wings, and hind legs, and number of ctenidiobothria on posterior T₁ (genitalia can not be compared as none of the *citricola* specimens have abdomens), we regard the latter two forms as synonyms of *citricola*.

Family LACHESILLIDAE Badonnel

Lachesilla forcepeta Chapman

Lachesilla forcepeta Chapman, 1930, p. 348.

Kerrville State Park, Sept. 20, 1951, beaten from cedar, 1 ♀, 2 nymphs, A. B. Gurney.

Lachesilla major Chapman

Lachesilla forcepeta var. *major* Chapman, 1930, p. 349; *Lachesilla major* Chapman, Sommerman, 1946, p. 645.

Ten miles west of Orange, Oct. 8, 1951, beating live oak and other oaks, A. B. Gurney.

Lachesilla nubilis (Aaron)

Caecilius nubilis Aaron, 1886, p. 13; *Lachesilla nubilis* (Aaron), Chapman, 1930, p. 351.

Kerrville, Sept. 21, 1951, at light in laboratory, 1 ♂, A. B. Gurney; Dilly, Frio State Park, Sept. 24, 1951, 1 ♂, A. B. Gurney; Dallas, Apr. 5, 1905, in dry cotton bolls, 2 ♂, 3 ♀, 9 nymphs. Type locality "Southern Texas" (Aaron). See records in Sommerman, 1946, p. 648.

Lachesilla pedicularia (Linnaeus)

Hemerobius pedicularia Linnaeus, 1758, p. 551. Synonymy presented by Enderlein, 1919, p. 16.

Dallas, April 15, 1908, 1 ♂, 1 ♀. F. C. Bishopp.

Lachesilla penta Sommerman

Lachesilla penta Sommerman, 1946, p. 652.

Corpus Christi State Park, Oct. 6, 1951, beating mesquite and other vegetation, 2 ♀, 2 nymphs. Type locality, Brownsville, May 2, 1904, 1 ♂, 1 ♀, H. S. Barber.

Lachesilla rena Sommerman

Lachesilla rena Sommerman, 1946, p. 653.

A male paratype was recorded from Brownwood, Tex., by Sommerman.

Lachesilla kathrynae, n. sp.

Figs. 44-47

Diagnosis.—A member of the species group including *L. anna* Sommerman, *L. chapmani* Sommerman, *L. forcepeta* Chapman, *L. contraforcepeta* Chapman, and *L. major* Chapman. Very similar to *L. chapmani*, differing in details of the genitalia in both sexes.

Holotype ♂.—Measurements: Total body length 1.33 mm; forewing length 1.53 mm; hindwing length 1.17 mm; hind tibia length 0.63 mm; hind tarsus: T₁ 0.267 mm, T₂ 0.080 mm.

Morphology.—Genitalia (Figs. 46, 47) with several characters typical of the species group—hypandrium of a large basal and small apical sclerite, the apical sclerite with a deep v-shaped cleft in its posterior margin. Parameres fused basally into a rod, but this rod curved rather than straight as in closely related species; parameres diverging apically, the two arms joined to the hypandrium along its cleft. Claspers curved out, stouter than in *L. chapmani*, and bulging near their apices. Paraprocts each with a ridge arising near sense tubercles and running to inner margins. Epiproct bearing a conspicuous apical tubercle as in *L. chapmani*.

Color (in alcohol).—Eyes black; antennae, wing veins, and dotted areas on vertex straw-colored. Body colorless except for red brown pigment distributed as follows: on cervical sclerites, on mesepimeral sutures, inner surfaces of coxae; two rows on each side of abdominal tergites 2 through 5, the dorsal rows continuing as weak spots to tergite 7.

Allotype ♀.—Measurements: Total body length 1.70 mm; forewing length 1.93 mm; hindwing length 1.37 mm; hind tibia length 0.73 mm; hind tarsus: T₁ 0.280 mm, T₂ 0.093 mm.

Morphology.—Gonapophyses (Fig. 45) a simple pair of flaps, narrowed near base and expanded preapically. Subgenital plate (Fig. 44) with an extended apical region; a more heavily sclerotized area (detectable by staining with acid fuchsin) outlined in dashed lines on the figure. Lacking a colored ventral interior plate.

Color (in alcohol).—Similar to holotype but abdominal red-brown spots present only on tergites 2 through 4.

Variation.—Some ♂ paratypes show the red-brown abdominal marks only on tergites 2 through 4, while some ♀ paratypes show them only on tergites 2 and 3.

Type locality.—Texas, Palm Grove near Brownsville, holotype ♂, allotype ♀, 5 ♂, and 17 ♀ paratypes, Oct. 3, 1951, beating dead palm leaves. Other paratypes: type locality, 5 ♂, 1 ♀, Oct. 1, 1951, beating palms; Mission, 2 ♂, 3 ♀, 1 nymph (not paratype), Sept. 30, 1951, beating palm leaves; Olmito Resaca near Brownsville, 1 ♀, Oct. 4, 1951, beating palms and palmettoes. All collected by A. B. Gurney.

Types in U. S. National Museum, no. 63240.

We are glad to dedicate this species to Dr. Kathryn M. Sommerman, in recognition of her many scholarly and highly basic studies of Neartic psocids.

Lachesilla bottimeri, n. sp.

Figs. 48-51

Diagnosis.—A member of the same species group as *L. kathrynae*, differing from all other members in possession of very long, incurved claspers in the male (Fig. 51) and in other genitalic details in both sexes.

Holotype ♂.—Measurements: Total body length 1.40 mm, forewing length 1.67 mm; hindwing length 1.27 mm; hind tibia length 0.70 mm; hind tarsus: T₁ 0.213 mm, T₂ 0.093 mm.

Morphology.—Genitalia with usual characters typical of the species group. Cleft in apical sclerite of hypandrium U-shaped. Rod formed by fused parameres straight; parameres diverging apically and joined to hypandrium along U-shaped cleft. Claspers long (exceeding tip of abdomen) and slender, curving in at their tips; tips sharply pointed.

Color (in alcohol).—Eyes black; antennae and thorax above tan; dotted areas of vertex, thorax below, legs, and genitalia pale straw-colored. Wing membranes clear, the veins brown. Remain-

der of head and abdomen unpigmented except for dark red-brown marks (also on thorax) distributed as follows: a line over each antennal insertion, the two joined by a pale brown line across front; the two lines above antennae each joined to a band starting posterior to antenna and continuing to abdominal segment 7, widest on abdomen.

Allotype ♀.—Measurements: Total body length 1.67 mm; forewing length 1.73 mm; hindwing length 1.33 mm; hind tibia length 0.73 mm; hind tarsus: T₁ 0.200 mm; T₂ 0.080 mm.

Morphology.—Gonapophyses (Fig. 49) a pair of rather elongate flaps, narrow at base and directed mesally near base. Subgenital plate (Fig. 48) with a very weakly delineated extended apical region; a more heavily sclerotized area (detectable by staining with acid fuchsin) outlined proximally in dashed lines and extending distally to the apex. A colored ventral interior plate absent.

Color same as in holotype.

Variation.—On one paratype ♀ the red-brown lateral bands do not extend beyond the 4th abdominal segment.

Type locality.—Texas, Palm Grove near Brownsville, holotype ♂, allotype ♀, 8 ♀ paratypes and 6 nymphs, Oct. 1, 1951, beating palms. Other paratypes (not including nymphs)—type locality, 14 ♂, 30 ♀, 26 nymphs, Oct. 2 and 3, 1951, beating dead palm leaves; near Brownsville, 1 ♀, Oct. 4, 1951. All collected by A. B. Gurney.

Types in U. S. National Museum, no. 63241.

It is a pleasure to name this species in honor of L. J. Bottimer, of Kerrville, Tex., a devoted collector and a specialist in the Bruchidae, who assisted the junior author in many ways while at Kerrville and during a week-end trip to Uvalde and Garner State Park.

Family ARCHIPSOCIDAE Pearman

Archipsocus floridanus Mockford

Archipsocus floridanus Mockford, 1953, p. 116.

Palm Grove near Brownsville, Oct. 3, 1951, 2 ♂, 12 macropterous ♀, 9 micropterous ♀, 16 nymphs, from webs on tree, A. B. Gurney.

Archipsocus nomas Gurney

Archipsocus nomas Gurney, 1939, p. 502.

Palm Grove near Brownsville, Oct. 2 and 3, 1951, webs on tree, 2 ♂, 3 macropterous ♀, 8

micropterous ♀, 6 nymphs, A. B. Gurney; Brownsville, Apr. 20, 1953, webs on ebony limb, 32 brachypterous ♀, 5 nymphs (some macropterous).

Group PSOCETAE Pearman

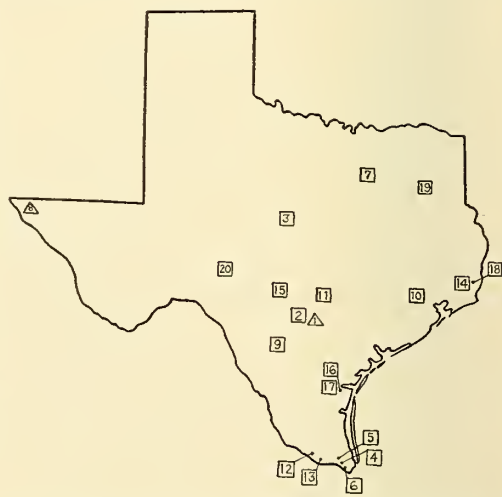
Family MYOPSOCIDAE Enderlein

Lichenomima sp.

Brownsville, Feb. 29, 1952, 1 ♀, D. L. Bauer.

FAMILY Psocidae Stephens

Dr. Sommerman is currently preparing a revision of this family for North America and will include distribution records from Texas in her paper. The following species have been recorded from Texas: *Psocus pollutus* Walsh, *P. bisignatus* Banks, *P. campestris* Aaron, *P. persimilis* Banks, *P. submarginatus* Aaron, *P. texanus* Aaron, *Trichadenotecnum unum* Sommerman, *Cerastipsocus venosus* (Burmeister), *Metilophorus purus* (Walsh), and *Blaste quieta* (Hagen).



MAP 1.—Outline map of Texas, showing location of localities mentioned. Squares represent definite localities, triangles county records only.

ALPHABETICAL LIST OF COUNTIES IN WHICH LOCALITIES MENTIONED IN THIS PAPER ARE LOCATED

Numbers on map correspond to those of the list.

1. Bexar—County record only.
2. Bexar—San Antonio.
3. Brown—Bangs; Brownwood (about 8 miles east of Bangs).

4. Cameron—Brownsville.
5. Cameron—Olmito Resaca.
6. Cameron—Palm grove.
7. Dallas—Dallas.
8. El Paso—County record only.
9. Frio—Dilly (Frio State Park).
10. Harris—Houston.
11. Hayes—San Marcos (Ezel's Cave).
12. Hidalgo—Mission.
13. Hidalgo—Weslaco.
14. Jefferson—Beaumont.
15. Kerr—Kerrville; Kerrville State Park.
16. Nueces—Corpus Christi.
17. Nueces—Corpus Christi State Park.
18. Orange—10 miles west of Orange.
19. Smith—Tyler.
20. Sutton—Sonora (Wyatt Cave).

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BARRO COLORADO BIRDDOM

On Barro Colorado Island, the Smithsonian Institution's tropical preserve in Gatun Lake, Panama Canal Zone, there is a "bird that roars like a lion." The roar, sometimes mistaken for the call of a howler monkey, is the male courtship song of the turkeylike curassow. The female usually is silent.

Weirdest of the feathered creatures of the preserve is the fruit-eating hawk known as "burja," the witch—a bird about the size of a raven. It has a coal-black back, a white belly, red feet, and a greenish-yellow bill which sometimes is slightly blue at the tip. The name, however, is due less to its weird appearance than to the almost continual "scolding" at other birds or at any intruder into its retreat.

What may appear like fashions in birddom is illustrated by the curious behavior of another Barro Colorado denizen, the motmot, a lovely grayish-green bird with a chestnut-colored head and neck. These have tails that look like tennis rackets. They are fashioned by the birds themselves which pluck off about an inch of the feather vane below the ends of the two outermost

feathers. The bird swings this tail from side to side like a pendulum.

A fierce little fighter is the violet-throated hummingbird, one of the most colorful feathered creatures found on the island. This bird, *Anthracothorax violaceicollis*, sometimes builds its solitary nest in the most exposed part of a tree, with no leaf within 25 feet or more. Then it demands dominion over the whole tree and does not hesitate to attack other birds many times its size. It attacks fearlessly, for example, the giant oriole, or oropendula, which is the size of a North American crow. The oriole is described as "helpless as a dirigible before a pursuit plane." When not fighting, the mother hummingbird sits on the nest nearly all the time, protecting eggs and young from sun and rain. The male seldom is seen. There is some reason to believe that his mate drives him away as soon as the eggs are laid. Although generally resentful of the large orioles in the same tree, sometimes it cooperates with them. A species of cowbird has a habit of laying its eggs in the oropendula nests. The hummingbird does not hesitate to drive it away, although its own nest is entirely safe.